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(54) Railway joint.

(57) A weldable austenitic manganese steel joint for railways, comprising an austenitic manganese steel member, including manganese 11.5 to 19% by wt, carbon 0.6 to 0.95% by wt, welded to a bainitic steel member, including boron up to 0.01% by wt, molybdenum 0.2 to 3% by wt, manganese 0.3 to 3% by wt, with the weld subsequently tempered to provide enhanced fatigue resistance by a post welding heat treatment.

EP 0 602 729 A1

This invention relates to a joint for the rails, frogs etc., of a railways, tramways, light rail transit systems etc., all hereinafter collectively referred to as "railway(s)", and to a method of manufacturing such a joint.

The advantage is self-evident of inserting a component of high wear resistant, but relatively expensive, steel, - conventionally an austenitic manganese steel - at a location of anticipated high wear e.g. at a crossing or frog. Mechanical connections, usually involving fish plates, have been used to secure such austenitic manganese steel components in position, but with the increasing installation of continuously welded rail, there is an increasing demand for an austenitic manganese steel crossing etc., capable of incorporation, by welding, in continuously welded rail track. However, austenitic manganese steel cannot be welded directly to pearlitic steel due to the composition and the differing heat treatments necessary to obtain the properties required of a railway rail. Consequently, the practice has evolved of interposing an insert of a third steel of composition that is weldable to both austenitic manganese steel and to pearlitic steel. One known proposal is for the insert to be of austenitic stainless steel, but being high in Cr and Ni this is relatively expensive and is not the simplest of materials to weld. Also, other proposals have involved the need to effect a pre or post heat treatment e.g. at 350 °c to 1000 °c, to refine and temper the weld to provide enhanced fatigue resistance.

According to a first aspect of the present invention, there is provided a weldable austenitic manganese steel joint for railways, comprising;

(i) an austenitic manganese steel member, including

manganese	11.5 to 19% by wt
carbon	0.6 to 0.95% by wt,

welded to

(ii) a bainitic steel member, including

boron up to	0.01% by wt
molybdenum	0.2 to 3% by wt
manganese	0.3 to 3% by wt

and preferably including

copper	up to 6% by wt
nickel	up to 6% by wt
chromium	up to 6% by wt,

with the weld subsequently tempered to provide enhanced fatigue resistance by a post welding heat treatment.

Clearly, for the joint to form a railway joint, then the bainitic steel member needs to have the same industry-standard rail profile as a rail of austenitic manganese steel. Furthermore, the former would normally then be welded to one end of a pearlitic steel rail length. The bainitic steel member is preferably a length of rail of industry-standard profile.

For joining to a frog etc., the bainitic steel member would again need to have a matching profile to that of the manganese steel frog member.

A second aspect of the invention, is directed to a method of manufacturing such a joint.

The post-welding heat treatment is preferably effected in factory controlled conditions, and is preferably effected in a flash butt welding machine, whereby close monitoring and control of the heat treatment parameters can be made.

Claims

1. A weldable austenitic manganese steel joint for railways, comprising;
   (i) an austenitic manganese steel member, including

manganese	11.5 to 19% by wt
carbon	0.6 to 0.95% by wt,

welded to
(ii) a bainitic steel member, including

boron up to	0.01% by wt
molybdenum	0.2 to 3% by wt
manganese	0.3 to 3% by wt

and preferably including

copper	up to 6% by wt
nickel	up to 6% by wt
chromium	up to 6% by wt,

with the weld subsequently tempered to provide enhanced fatigue resistance by a post welding heat treatment.

2. A joint as claimed in Claim 1, wherein the bainitic steel member is a length of rail of industry-standard profile.

3. A method of manufacturing the joint defined in Claim 1 or Claim 2, comprising welding
(i) an austenitic manganese steel member, including

manganese	11.5 to 19% by wt
carbon	0.6 to 0.95% by wt,

to
(ii) a bainitic steel member, including

boron up to	0.01% by wt
molybdenum	0.2 to 3% by wt
manganese	0.3 to 3% by wt

which preferably includes

copper	up to 6% by wt
nickel	up to 6% by wt
chromium	up to 6% by wt,

and then subsequently tempering the weld to provide enhanced fatigue resistance by a post welding heat treatment.

4. A method as claimed in Claim 3, wherein welding of the austenitic manganese steel member to the bainitic steel member is effected in a flash butt welding machine.

5. A method as claimed in Claim 3 or Claim 4, wherein the post welding heat treatment is effected in a flash butt welding machine.

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EUROPEAN SEARCH REPORT

Application Number
EP 93 20 3462

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.5)
A	EP-A-0 070 774 (CREUSOT-LOIRE) 26 January 1983 *Claims and page 3, lines 2-8*	1-5	C22C38/00 B23K33/00 E01B7/12
A	PECKNER AND BERNSTEIN 'Handbook of Stainless Steels' 1977 , MCGRAW HILL BOOK COMPANY , US *4-16, 4-17, 26-8, 26-9, 26-10*	1-5	
A	US-A-5 041 174 (FERNAND PONS) 20 August 1991 *Claims*	1-5	
A	EP-A-0 260 233 (BREDA FUCINE MERIDIONALI S.P.A.) 16 March 1988 *Claims*	1-5	
A	EP-A-0 213 111 (VOEST-ALPINE A.G.) 4 March 1987 *Claims*	1-5	
A	GB-A-1 552 392 (VEREINIGTE ÖSTERREICHISCHE EISEN- UND STAHL WERKE-ALPINE MONTAN A.G.) 12 September 1979 *Claims*	1-5	TECHNICAL FIELDS SEARCHED (Int.Cl.5) C22C B23K E01B
A	EP-A-0 181 251 (COMPAGNIE FRANCAISE DE FORGES ET DE FONDERIES) 14 May 1986	1-5	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	21 March 1994	Badcock, G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
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P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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